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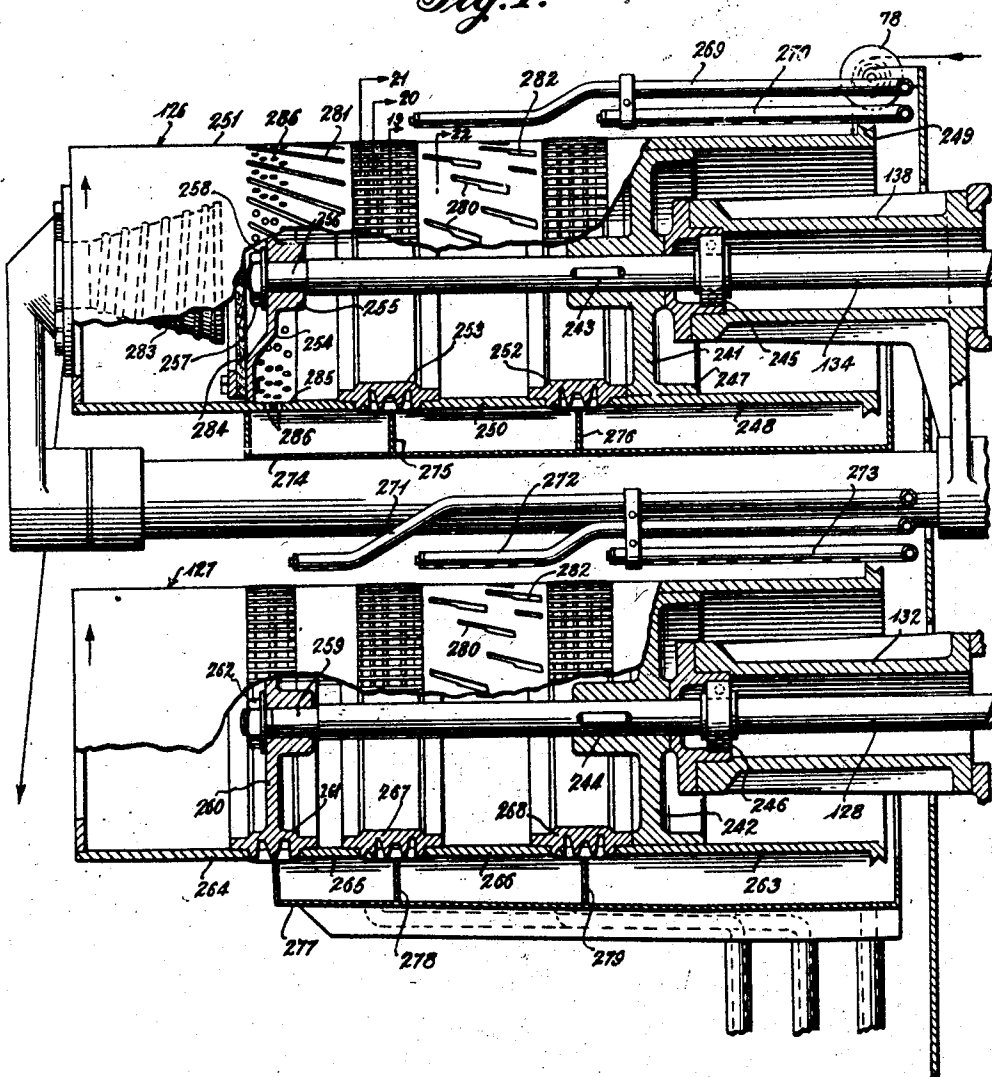
APPARATUS FOR WET TREATMENT AND DRYING OF A

MOVING WET SPUN SYNTHETIC THREAD STRAND

Original Filed July 14, 1942

2 Sheets-Sheet 1

Fig. 1.



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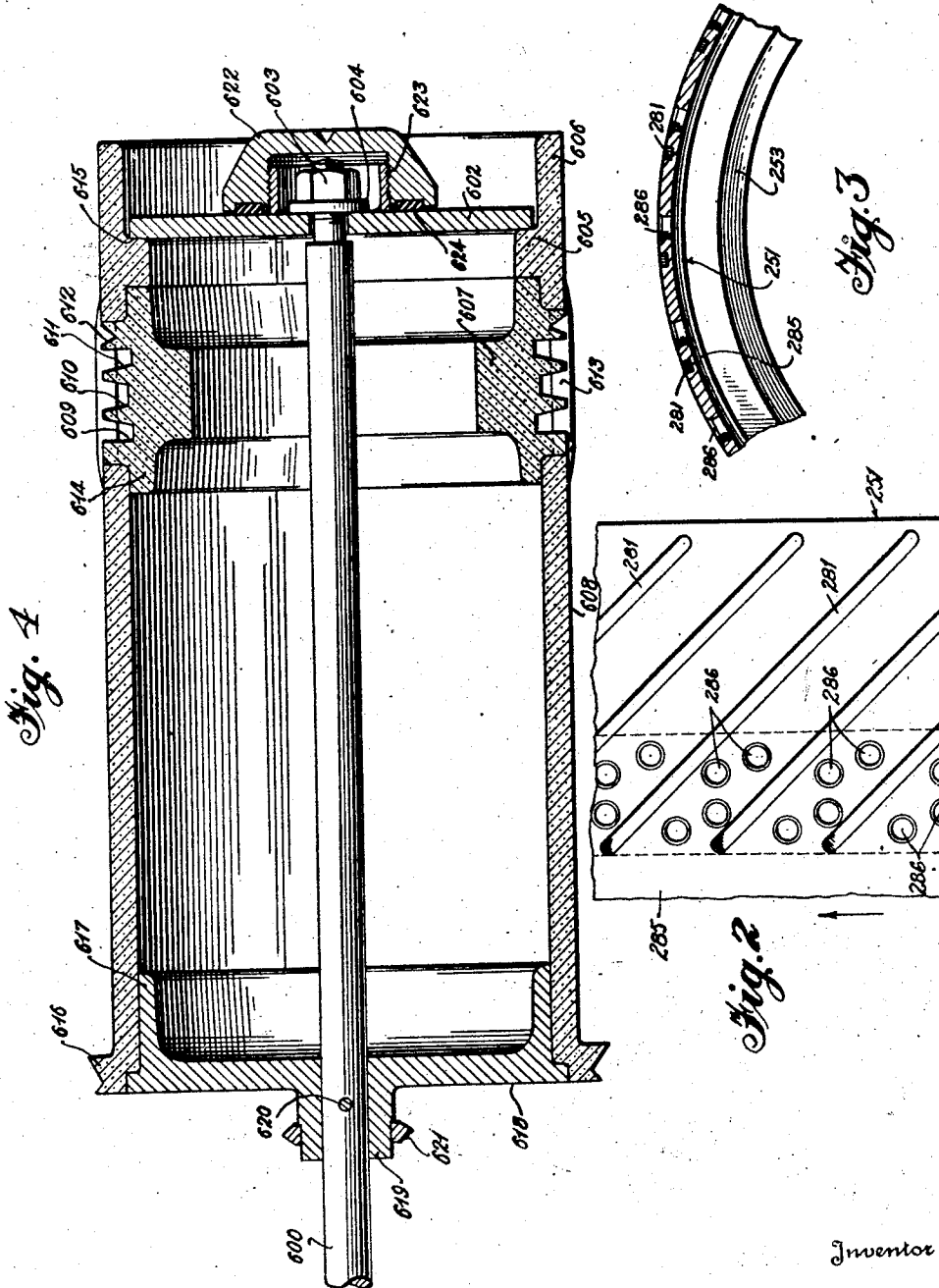
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UNITED STATES PATENT OFFICE

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APPARATUS FOR WET TREATMENT AND DRYING OF A MOVING WET SPUN SYNTHETIC THREAD STRAND

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5 Claims. (Cl. 68—200)

1

This invention relates to the treatment of thread, and is more particularly concerned with apparatus for wet treatment and drying a moving thread strand.

It has long been recognized in the textile arts that thread in extended form can be more readily wet treated and dried than is possible if the thread is wound in packages composed of superposed helical layers. In such processes, for instance, as in the after-treatment of thread of synthetic origin, in the coating and impregnating of thread or strands, such as the coating of fishing lines or insulating strands with varnish and in like operations, the advantages of exposing each portion to the treating fluids is obvious. Also important in such processes is the retention of the thread in extended form during the drying period.

Many proposals for so treating threads of synthetic origin have been advanced, for instance, German Patents 209,923, 300,254 and 448,437, British Patents 315,405 and 379,880 and French Patents 379,935 and 625,049, all disclose treating thread of synthetic origin while in extended form. United States Patent 34,494, French Patent 183,001, German Patents 233,370 and 183,001 disclose treating thread from any source while it is in extended form. In many instances the patents above referred to disclose not only wet treating but drying the thread in the course of its travel in extended form or while it is being advanced in the form of a single layer of travelling helices.

The primary object of this invention is to facilitate the wet treatment and drying of thread while it is being advanced in extended form.

Another object is to establish a definite line of demarcation between different treating zones of a thread-advancing thread-store device upon which the thread to be treated is supported in the form of a single layer of travelling helices.

The above and other objects may be attained by employing this invention, which embodies among its features a thread-advancing thread-store device separated longitudinally into at least one liquid treating zone and a heated drying zone and means to inhibit the conduct of heat from the drying zone to an adjacent zone.

Figure 1 is a view partially in section and partially in side elevation of a thread-storage, thread-advancing unit embodying this invention;

Figure 2 is a development of the cylindrical surface constituting a portion of the cooling zone of the upper roller of the thread-storage, thread-advancing device of Figure 1;

2

Figure 3 is a fragmentary view in section of the cylinder developed in Figure 2;

Figure 4 is a longitudinal sectional view of a roller of a thread-storage, thread-advancing unit constructed of a carbon-graphite composition.

Thread-storage, thread-advancing unit is composed of two rollers 126 and 127 which are driven from shafts 134 and 128, respectively, through spiders 241 and 242, keyed respectively at 243 and 244, as can be seen in Figure 1. Note also that housings 138 and 132 extend well into rollers 126 and 127 so that bearings 245 and 246 may be located on shafts 134 and 128 a substantial distance toward the unsupported end of the device.

The shaft 128 of lower roller 127 extends in a truly horizontal direction while the shaft 134 of the upper roller 126 extends in a sloping direction, such that the axes of the two rollers 127 and 126 are convergent in the direction of their unsupported ends, and the rollers themselves lie in intersecting planes.

Spider 241 is provided with a cylindrical portion 247 over which a cylinder 248 is pressed. This cylinder is provided with an annular flange 249. Roller 126 includes, in addition to cylinder 248, cylinders 250 and 251, and shouldered annular members 252 and 253. The cylinders are fitted over the shouldered portions of annular members 252 and 253. Integral with or attached to cylinder 251 is a spider 254 provided with a central hub 255 through which the threaded free end 256 of a shaft 134 is passed. A nut 257 may be drawn against a washer 258 to pull cylinder 251 toward cylinder 248, thereby holding the intermediate annular members and cylinder 250 so that the entire assembly may function as a unit.

Practically an identical arrangement is used in drawing together the component parts of roller 127. In the latter case, shaft 128 is provided with a threaded end 259 passing through a central aperture in a spider 260 integral with an annular member 261, and a nut 262 engaging shaft end 259 serves to draw together all of the components of roller 127 between annular member 261 and a cylinder 263, similar to cylinder 248 of roller 126. Cylinder 264 is pressed over a shoulder of annular member 261 so that it need not be subjected to the compressive force exerted by nut 262. Between annular member 261 and cylinder 253, two cylinders 265 and 266 and two shouldered annular members 267 and 268 are interposed the arrangement being as previously described in conjunction with roller 126.

The various cylinders making up the unit are

provided with liquid supply pipes as may be seen in Figure 1. Thus, a pipe 269 supplies liquid above cylinder 250 and similar pipes 270, 271, 272 and 273 perform a corresponding function in connection with cylinders 248, 265, 266, and 263, respectively. Underlying cylinder 126 is a collection trough 274 having partitions 275 and 276 underlying respectively annular members 253 and 252. In this way, liquid supplied to the various component cylinders of roller 216 may be separately recovered. A trough 277 underlies roller 127 and this trough is partitioned at 278 and 279, the partitions underlying respectively annular members 267 and 268.

Upon reference to Figure 1 it will be noted that cylinders 250 and 266 are provided with grooves 280 and that there are some grooves 281 at the right hand side of cylinder 251. These grooves function to distribute liquids over the surface of the cylinders in which they are located, the liquids being supplied from the pipes disposed above the particular cylinder.

In the aftertreatment of freshly spun viscose, the yarn is led from a source, not shown, over a guide roller 78 and onto cylinders 248 and 263 which can be conveniently employed as a desulphurizing zone. The desulphurizing liquid has been found to be self-distributing, the treatment is a chemical one, and, for that reason, the surfaces of cylinders 248 and 263 need not be grooved. Cylinders 259 and 266 constitute washing zone. Here substantial quantities of water are supplied to the cylinders and are moved from left to right as viewed in Figure 1. Cylinder 265 is used for the application of a finishing solution to the thread. This solution need not be supplied in large amounts and having a low surface tension, is more or less self-distributing. Consequently, cylinder 265 is not provided with grooves to cause axial movement of the liquid supplied from pipe 271. Since only a small amount of the finishing solution is applied to the thread, no similar zone on roller 126 is required. However, a portion of cylinder 251 extends over cylinder 265 and the former, near its unsupported end, is provided with a heating unit 283 which is in registry with cylinder 264 of roller 127. This is a radiant heat unit, fully described in Patent No. 2,244,745. As a result of its use, the surface of cylinder 251 adjacent the unsupported end thereof is subjected to considerable heat. It is undesirable, however, that the finishing solution be dried before it is applied in an adequate amount. Consequently, a heat insulated disc 284 serves to divide the interior of cylinder 251 into two portions. Disc 284 is conveniently held in position by bolting to spider 254. Disc 284 prevents the radiation of heat into the portion of cylinder 251 which is in vertical registry with cylinder 265. The surface of cylinder 251, however, is of a heat conductive material. Thus, to prevent the surface conduction of heat along cylinder 251 beyond disc 284, a cooling zone 285 is interposed. This cooling zone is best viewed in Figures 2 and 3. It can be seen that the thickness of cylinder 251 is reduced at annular zone 285 and that a number of perforations 286 are provided therein. These allow the atmospheric air in the spinning rooms to pass through a portion of the cylinder to cool the same. Grooves 281, on the surface of cylinder 251, tend to move any finishing solution carried by the thread from cylinder 265 to cylinder 251 to the right of the latter as it is viewed in Figure 1 so that it cannot get onto the heating zone.

In Figure 4 there is shown a modified type of cylinder to be used in duplicate to form a thread-storage, thread-advancing device. This cylinder is composed of a carbon and graphite composition as distinguished from the normal construction which contemplates a stainless steel surface usually satisfactorily resistant to the various chemicals employed. Except for thickness of material, due to reduced strength thereof, the structure is similar to the forms previously described. Thus, a roller drive shaft 600 is provided having, at its free end, a threaded area 601 of reduced cross-section. This area is passed through a central aperture in a steel clamping plate 602 which plate is urged toward the supported end of the roller by a nut 603 acting against a washer 604. Plate 602 rests against an interior annular flange 605 of a cylinder 606, the cylinder being composed entirely of a carbon and graphite composition molded in the shape desired. An annular member 607 is located between cylinder 606 and another cylinder 608, this annular member defining a separation zone by virtue of being provided with exterior annular grooves 609, 610, 611 and 612, bridges 613 crossing all of the grooves and presenting a rounded interrupted surface lying slightly above the surfaces of cylinders 608 and 606. Annular member 607 is similar to the corresponding members in the steel construction forms of the invention previously described, except that it is somewhat thicker, and can withstand the stress brought about by drawing down plate 602. Shoulders 614 and 615 thereof respectively receive the edges of cylinders 608 and 607. Cylinder 608 is provided with an exterior annular flange 616 and is pressed over a cylindrical portion 617 of a steel spider 618, having a hub 619 keyed at 620 to shaft 600. An annular flange 621 may be disposed on hub 619 to act as a dam to prevent any accidental movement of corrosive liquids into the drive connections for shaft 600. Similarly, a cap 622 may be screwed over a boss 623 against a washer 624 to protect the threaded connection between portion 601 of shaft 600 and nut 603.

I wish to emphasize that the process may be modified to allow wet spinning of any other synthetic thread. Thus it is possible, with adequate changes of the treatment baths, to spin cuprammonium solutions, solutions of cellulose esters, polymerized hydrocarbons and derivatives thereof, etc. Modification of the process and the apparatus will readily be foreseen by those skilled in the art, and I desire to include all modifications and variations coming within the scope of the appended claims.

This is a division of my application Serial No. 450,934, filed July 14, 1942, entitled "Process and apparatus for the manufacture of synthetic yarn."

I claim:

1. Apparatus for the aftertreatment of wet spun synthetic thread and the like comprising, a driven thread-storage, thread-advancing device comprised of two cylindrical rollers, the axes of which lie in intersecting planes, at least one of said rollers being hollow and the surface thereof being provided with a plurality of circumferentially spaced helical grooves disposed in a cylindrical zone, means for heating a portion of the surface of said roller in a cylindrical zone axially spaced from said grooved zone, said roller being perforate and of lesser thickness intermediate said two zones, whereby conduction of heat from the heated zone to the grooved zone is minimized.

5

2. Apparatus as claimed in claim 1, in which the heating means is disposed within the roller in registry with the heated zone thereof, and in which the roller is interiorly subdivided by heat insulating material, disposed between the heated zone and the grooved zone.

3. Apparatus for the after-treatment of wet spun synthetic thread and the like comprising a driven thread-storage, thread-advancing device comprised of two cylindrical rollers the axes of which lie in intersecting planes, one of said rollers being hollow and a portion of the surface thereof constituting a zone for the liquid treatment of thread, means for heating another portion of the surface of said roller axially spaced from said first portion, said roller being perforate and of lesser thickness intermediate said two portions whereby conduction of heat from the heated portion to the liquid treatment zone is minimized.

4. Apparatus as claimed in claim 3 in which the heating means is disposed within the roller and in which that roller is interiorly subdivided by heat insulating means disposed between the liquid treatment zone and the heated portion of the roller.

5. Apparatus for use in the manufacture of thread of synthetic origin comprising a thread supporting and advancing unit consisting of at least two rollers, the axes of which lie in intersecting planes, means for driving at least one of the rollers to cause thread wound around the unit to progress axially thereof in the form of spaced connected coils in the direction of the intersec-

6

tion of the planes, means for supplying treating liquids to spaced points along the surface of one of the rollers of the unit, a plurality of means responsive to rotation of that roller for forming cylindrical liquid bands of controlled axial length therearound, said last-named means lying in registry with respective points of liquid supply, means acting on another roller for heating a portion of the surface thereof to dry thread passed therearound, the heated surface lying nearer the point of plane intersection than any of the roller rotation responsive means and out of registry with all of them, and means for limiting the extent of axial conduction of heat along the roller to a zone out of registry with any liquid band, whereby liquid treatment and drying may be accomplished on a single thread supporting and advancing unit in the order named, and without mutual interference.

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